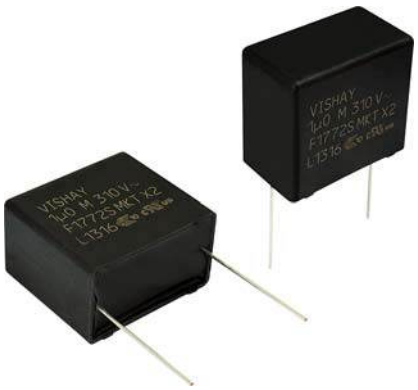
Interference Suppression Film Capacitor - Class X2
Radial MKT - 310 V_{AC} - Series Impedance - 85 °C / 85 % RH



FEATURES

- Stable capacitance in severe ambient conditions 85 °C; 85 % RH, 240 V_{AC}, 1000 h
- 15 mm to 27.5 mm lead pitch
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

APPLICATIONS

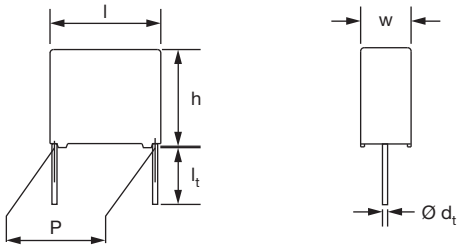
High stability grade X2 capacitors for series impedance and across the line applications.
See also application note: www.vishay.com/doc?28153

QUICK REFERENCE DATA	
Capacitance range (E12 series)	10 nF to 2.2 µF (preferred values according to E6)
Capacitance tolerance	± 10 %; ± 20 %
Rated AC voltage	310 V_{AC}
Climatic testing class according to IEC 60068-1	55/110/56
Rated temperature	C ≤ 1 µF: 110 °C C > 1 µF: 105 °C
Reference standards	IEC 60384-14 ed-4 and EN 60384-14 IEC 60065 requires pass. flamm. class: B for volumes > 1750 mm^3 C for volumes ≤ 1750 mm^3 UL 60384-14; CSA-E384-14
Dielectric	Polyester film
Electrodes	Metallized
Construction	Series construction
Encapsulation	Plastic case, epoxy resin sealed, flame retardant UL-class 94 V-0
Leads	Tinned wire
Marking	C-value; tolerance; rated voltage; sub-class; manufacturer's type; code for dielectric material; manufacturer location, year and week; manufacturer's logo or name; safety approvals

Notes

- For more detailed data and test requirements, contact rfi@vishay.com
- For general information like characteristics and definitions used for film capacitors follow the link: www.vishay.com/doc?28147

DIMENSIONS in millimeters



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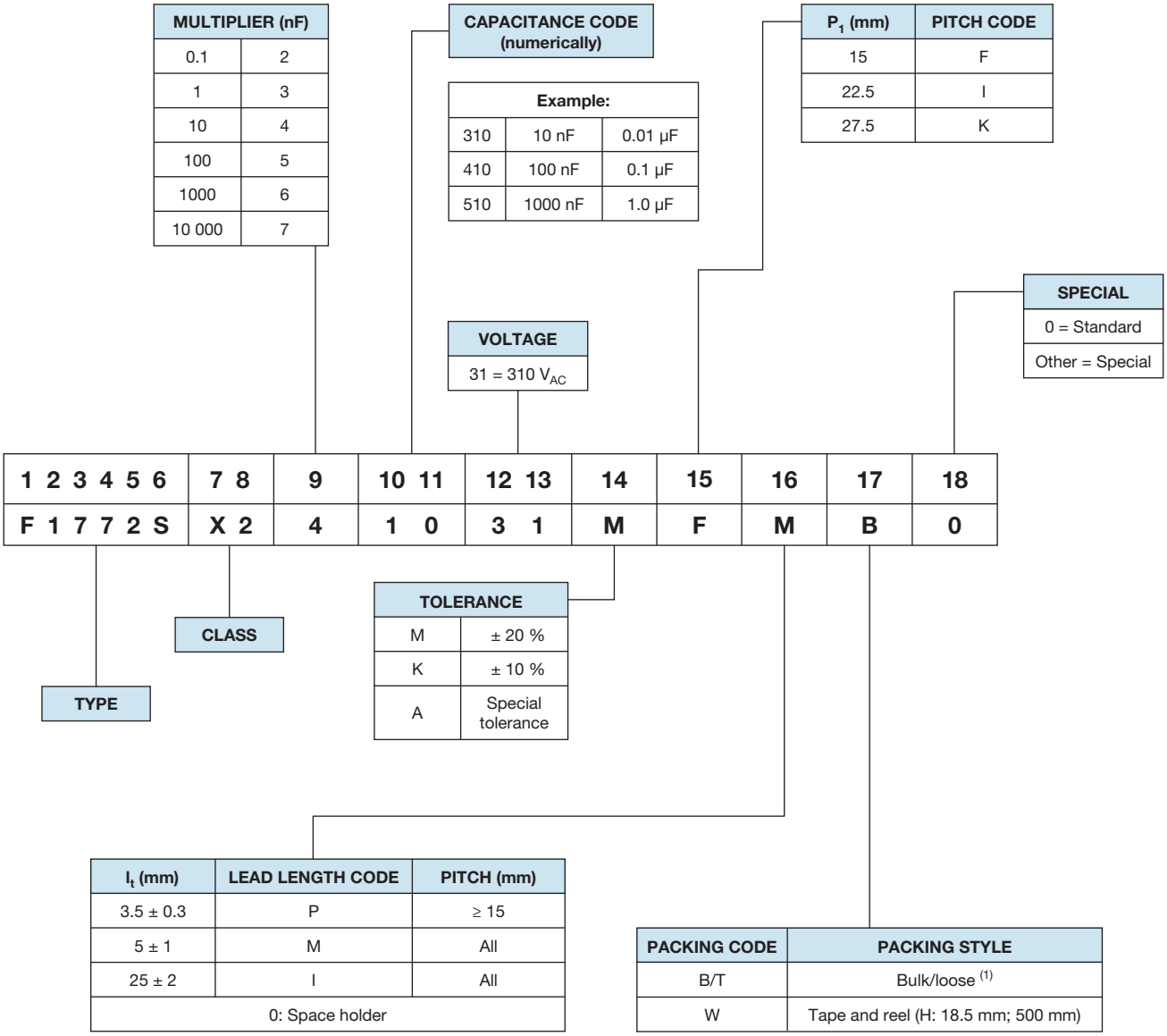
COMPOSITION OF CATALOG NUMBER



Notes

- For detailed tape specifications refer to packaging information www.vishay.com/doc?28139

(1) Packaging will be bulk for all capacitors with pitch ≤ 15 mm and such with long leads (> 5 mm).
Capacitors with short leads up to 5 mm and pitch > 15 mm will be in tray and asking code will be “T”.

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SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE
Rated AC voltage (U_{RAC})	310 V_{AC}
Rated DC voltage (U_{RDC})	630 V_{DC}
Tangent of loss angle	≤ 100 x 10^{-4} at 1 kHz
Rated voltage pulse slope $(dU/dt)_R$ at 435 V_{DC}	100 V/µs
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 15 000 MΩ
RC between leads, for C > 0.33 µF at 100 V; 1 min	> 5000 s
R between leads and case; 100 V; 1 min	> 30 000 MΩ
Withstanding (DC) voltage (cut off current 10 mA) (1); rise time ≤ 1000 V/s: C ≤ 1.0 µF C > 1.0 µF	 1800 V; 1 min 1500 V; 1 min
Withstanding (AC) voltage between leads and case	2120 V; 1 min
Maximum application temperature	C ≤ 1 µF: 110 °C C > 1 µF: 105 °C

Note
(1) See "Voltage Proof Test for Metalized Film Capacitors": www.vishay.com/doc?28169

ELECTRICAL DATA AND ORDERING INFORMATION

U_{RAC} (V)	CAP. (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER F1772S X2... AND PACKAGING						
				LOOSE IN BOX					REEL (1)(2)	
				SHORT LEADS			LONG LEADS			
				l_t = 3.5 mm ± 0.3 mm	l_t = 5.0 mm ± 1.0 mm	SPQ	l_t = 25.0 mm ± 2.0 mm	SPQ	Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
310	PITCH = 15 mm ± 0.4 mm; d_t = 0.60 mm ± 0.06 mm; C-TOL. = ± 20 %									
	0.010	5.0 x 11.0 x 17.5	1.0	31031MFPB0	31031MFMB0	1250	31031MFIB0	1000	31031MF0W0	1100
	0.015			31531MFPB0	31531MFMB0		31531MFIB0		31531MF0W0	
	0.022			32231MFPB0	32231MFMB0		32231MFIB0		32231MF0W0	
	0.033			33331MFPB0	33331MFMB0		33331MFIB0		33331MF0W0	
	0.047			34731MFPB0	34731MFMB0		34731MFIB0		34731MF0W0	
	0.068	6.0 x 12.0 x 17.5	1.4	36831MFPB0	36831MFMB0	1000	36831MFIB0	1000	36831MF0W0	900
	0.10			41031MFPB0	41031MFMB0		41031MFIB0		41031MF0W0	
	PITCH = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm; C-TOL. = ± 20 %									
	0.15	8.5 x 15.0 x 17.5	2.4	41531MFPB0	41531MFMB0	750	41531MFIB0	500	41531MF0W0	650
	0.22	10.0 x 16.5 x 17.5	3.0	42231MFPB0	42231MFMB0	500	42231MFIB0	450	42231MF0W0	600
	0.33	10.5 x 17.5 x 18.0	4.0	43331MFPB0	43331MFMB0	250	43331MFIB0	400	43331MF0W0	600
	PITCH = 15 mm ± 0.4 mm; d_t = 0.60 mm ± 0.06 mm; C-TOL. = ± 10 %									
	0.010	5.0 x 11.0 x 17.5	1.0	31031KFPB0	31031KFMB0	1250	31031KFIB0	1000	31031KF0W0	1100
	0.012			31231KFPB0	31231KFMB0		31231KFIB0		31231KF0W0	
	0.015			31531KFPB0	31531KFMB0		31531KFIB0		31531KF0W0	
	0.018			31831KFPB0	31831KFMB0		31831KFIB0		31831KF0W0	
	0.022			32231KFPB0	32231KFMB0		32231KFIB0		32231KF0W0	
	0.027			32731KFPB0	32731KFMB0		32731KFIB0		32731KF0W0	
	0.033			33331KFPB0	33331KFMB0		33331KFIB0		33331KF0W0	
	0.039			33931KFPB0	33931KFMB0		33931KFIB0		33931KF0W0	
	0.047			34731KFPB0	34731KFMB0		34731KFIB0		34731KF0W0	
	0.056			35631KFPB0	35631KFMB0		35631KFIB0		35631KF0W0	
	0.068	6.0 x 12.0 x 17.5	1.4	36831KFPB0	36831KFMB0	1000	36831KFIB0	1000	36831KF0W0	900
	0.082			38231KFPB0	38231KFMB0		38231KFIB0		38231KF0W0	
	PITCH = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 %									
	0.10	7.0 x 13.5 x 17.5	1.8	41031KFPB0	41031KFMB0	750	41031KFIB0	500	41031KF0W0	800
	0.12			41231KFPB0	41231KFMB0		41231KFIB0		41231KF0W0	
	0.15	8.5 x 15.0 x 17.5	2.4	41531KFPB0	41531KFMB0	750	41531KFIB0	500	41531KF0W0	650
	0.18			41831KFPB0	41831KFMB0		41831KFIB0		41831KF0W0	
	0.22	10.0 x 16.5 x 17.5	3.0	42231KFPB0	42231KFMB0	500	42231KFIB0	450	42231KF0W0	600
	0.27	10.5 x 17.5 x 18.0	4.0	42731KFPB0	42731KFMB0	250	42731KFIB0	400	42731KF0W0	600
	0.33	11.0 x 18.5 x 18.0	5.0	43331KFPB0	43331KFMB0	225	43331KFIB0	350	43331KF0W0	550

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ELECTRICAL DATA AND ORDERING INFORMATION

U_{RAC} (V)	CAP. (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER F1772S X2... AND PACKAGING						
				LOOSE IN BOX					REEL [1][2]	
				SHORT LEADS			LONG LEADS			
				l_t = 3.5 mm ± 0.3 mm	l_t = 5.0 mm ± 1.0 mm	SPQ	l_t = 25.0 mm ± 2.0 mm	SPQ	Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
310	PITCH = 22.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm; C-TOL. = ± 20 %									
	0.15	6.0 x 15.5 x 26.0	2.4	41531MIPT0	41531MIMT0	300	41531MIIB0	250	41531MI0W0	600
	0.22	7.0 x 16.5 x 26.0	2.9	42231MIPT0	42231MIMT0	200	42231MIIB0	250	42231MI0W0	500
	0.33	8.5 x 18.0 x 26.0	3.8	43331MIPT0	43331MIMT0	200	43331MIIB0	250	43331MI0W0	450
	0.41			44131MIPT0	44131MIMT0		44131MIIB0		44131MI0W0	
	0.47	10.0 x 19.5 x 26.0	6.8	44731MIPT0	44731MIMT0	200	44731MIIB0	200	44731MI0W0	350
	0.68	12.0 x 22.0 x 26.0	7.8	46831MIPT0	46831MIMT0	150	46831MIIB0	200	46831MI0W0	300
	1.0	15.5 x 26.5 x 26.5	9.0	51031MIPT0	51031MIMT0	110	51031MIIB0	275	51031MI0W0	250
	1.5	18.0 x 29.5 x 26.5	10.0	51531MIPT0	51531MIMT0	90	51531MIIB0	250	51531MI0W0	200
	PITCH = 22.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 %									
	0.10	6.0 x 15.5 x 26.0	2.4	41031KIPT0	41031KIPT0	300	41031KIB0	250	41031KI0W0	600
	0.12			41231KIPT0	41231KIMT0		41231KIIB0		41231KI0W0	
	0.15	7.0 x 16.5 x 26.0	2.9	41531KIPT0	41531KIMT0	200	41531KIIB0	250	41531KI0W0	500
	0.18			41831KIPT0	41831KIMT0		41831KIIB0		41831KI0W0	
	0.22			42231KIPT0	42231KIMT0		42231KIIB0		42231KI0W0	
	0.27	8.5 x 18.0 x 26.0	3.8	42731KIPT0	42731KIMT0	200	42731KIIB0	250	42731KI0W0	450
	0.33			43331KIPT0	43331KIMT0		43331KIIB0		43331KI0W0	
	0.39	10.0 x 19.5 x 26.0	6.8	43931KIPT0	43931KIMT0	200	43931KIIB0	200	43931KI0W0	350
	0.41			44131KIPT0	44131KIMT0		44131KIIB0		44131KI0W0	
	0.47			44731KIPT0	44731KIMT0		44731KIIB0		44731KI0W0	
	0.56	12.0 x 22.0 x 26.0	7.8	45631KIPT0	45631KIMT0	150	45631KIIB0	200	45631KI0W0	300
	0.68			46831KIPT0	46831KIMT0		46831KIIB0		46831KI0W0	
	0.82	12.5 x 22.5 x 26.5	8.2	48231KIPT0	48231KIMT0	140	48231KIIB0	400	48231KI0W0	300
	1.0	15.5 x 26.5 x 26.5	9.0	51031KIPT0	51031KIMT0	110	51031KIIB0	275	51031KI0W0	250
	1.2			51231KIPT0	51231KIMT0		51231KIIB0		51231KI0W0	
	PITCH = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm; C-TOL. = ± 20 %									
	0.39	9.0 x 19.0 x 31.5	5.5	43931MKPT0	43931MKMT0	100	43931MKIB0	150	-	-
	0.41			44131MKPT0	44131MKMT0		44131MKIB0			
	0.47			44731MKPT0	44731MKMT0		44731MKIB0			
	0.68	11.0 x 21.0 x 31.0	7.4	46831MKPT0	46831MKMT0	100	46831MKIB0	125		
	1.0	15.0 x 23.0 x 31.0	11.0	51031MKPT0	51031MKMT0	100	51031MKIB0	100		
	1.5	18.0 x 28.0 x 31.5	12.3	51531MKPT0	51531MKMT0	100	51531MKIB0	100		
	2.2	21.0 x 31.0 x 31.0	16.1	52231MKPT0	52231MKMT0	50	52231MKIB0	75		
	PITCH = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm; C-TOL. = ± 10 %									
	0.39	9.0 x 19.0 x 31.5	5.5	43931KKPT0	43931KKMT0	100	43931KKIB0	150	-	-
	0.41			44131KKPT0	44131KKMT0		44131KKIB0			
	0.47			44731KKPT0	44731KKMT0		44731KKIB0			
	0.56	11.0 x 21.0 x 31.0	7.4	45631KKPT0	45631KKMT0	100	45631KKIB0	125		
	0.68			46831KKPT0	46831KKMT0		46831KKIB0			
	0.82			48231KKPT0	48231KKMT0		48231KKIB0			
	1.0	15.0 x 25.0 x 31.5	11.0	51031KKPT0	51031KKMT0	100	51031KKIB0	125		
	1.2	18.0 x 28.0 x 31.5	12.3	51231KKPT0	51231KKMT0	100	51231KKIB0	100		
	1.5			51531KKPT0	51531KKMT0		51531KKIB0			
	1.8	21.0 x 31.0 x 31.0	16.1	51831KKPT0	51831KKMT0	50	51831KKIB0	75		
	2.2			52231KKPT0	52231KKMT0		52231KKIB0			

Notes

- SPQ = Standard Packing Quantity

(1) Reel diameter = 356 mm is available on request

(2) H = in-tape height; P_0 = sprocket hole distance; for detailed specifications refer to “Packaging Information”

(3) Weight for short lead product only

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APPROVALS				
SAFETY APPROVALS X2	**VOLTAGE**	**VALUE**	**FILE NUMBERS**	**LINK**
EN 60384-14 (ENEC) (= IEC 60384-14 ed-4)	310 V_{AC}	0.01 µF to 2.2 µF X2	40005079	www.vishay.com/doc?28225
UL 60384-14	310 V_{AC}	0.01 µF to 2.2 µF X2	E354331	www.vishay.com/doc?28231
CSA-E384-14	310 V_{AC}	0.01 µF to 2.2 µF X2	E354331	
CB-test certificate	310 V_{AC}	0.01 µF to 2.2 µF X2	DE1-58410	www.vishay.com/doc?28226
The ENEC-approval together with the CB-certificate replace all national marks of the following countries (they have already signed the ENEC-agreement): Austria; Belgium; Czech. Republic; Denmark; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Luxembourg; Netherlands; Norway; Portugal; Slovenian; Spain; Sweden, Switzerland and United Kingdom.				

MOUNTING

Normal Use

The capacitor unit is designed for mounting on a printed-circuit board. The capacitors packed in bandoliers are designed for mounting on printed-circuit boards by means of automatic insertion machines.

For detailed tape specifications refer to packaging information www.vishay.com/docs?28139

Specific Method of Mounting to Withstand Vibration and Shock

In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board. The capacitor shall be mechanically fixed by the leads and the body clamped.

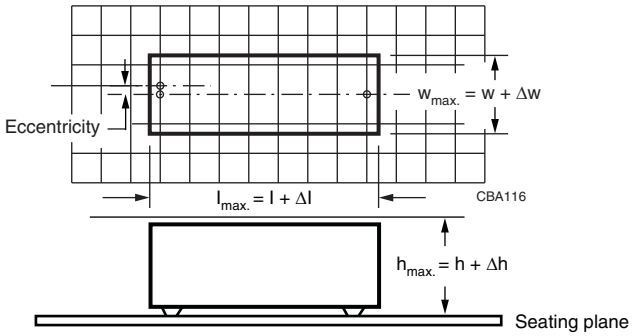
- For pitches ≤ 15 mm the capacitors shall be mechanically fixed by the leads
- For larger pitches the capacitors shall be mounted in the same way and the body clamped

Space Requirements on Printed-Circuit Board

The maximum space for length ($l_{max.}$), width ($w_{max.}$) and height ($h_{max.}$) of film capacitors to take in account on the printed circuit board is shown in the drawings.

- For products with pitch ≤ 15 mm, $\Delta w = \Delta l = 0.3$ mm and $\Delta h = 0.1$ mm
- For products with 15 mm < pitch ≤ 27.5 mm, $\Delta w = \Delta l = 0.5$ mm and $\Delta h = 0.1$ mm

Eccentricity defined as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned.



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SOLDERING CONDITIONS

For general soldering conditions and wave soldering profile we refer to the document “Soldering Guidelines for Film Capacitors”: www.vishay.com/doc?28171

Storage Temperature

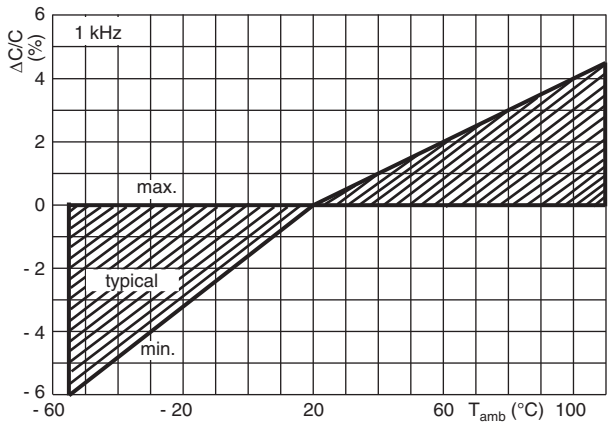
T_{stg} = -25 °C to +35 °C with RH maximum 75 % without condensation

Ratings and Characteristics Reference Conditions

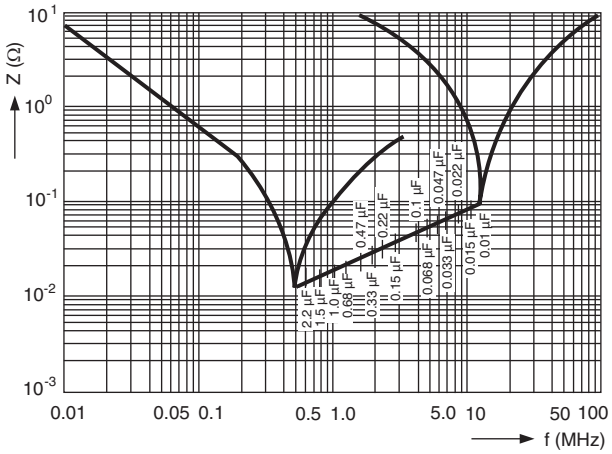
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of 50 % ± 2 %.

For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

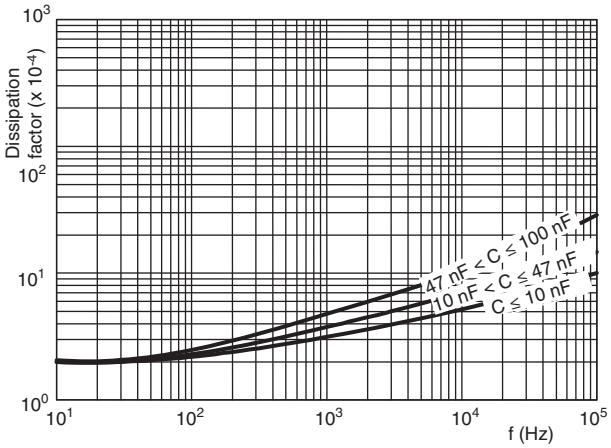
CHARACTERISTICS



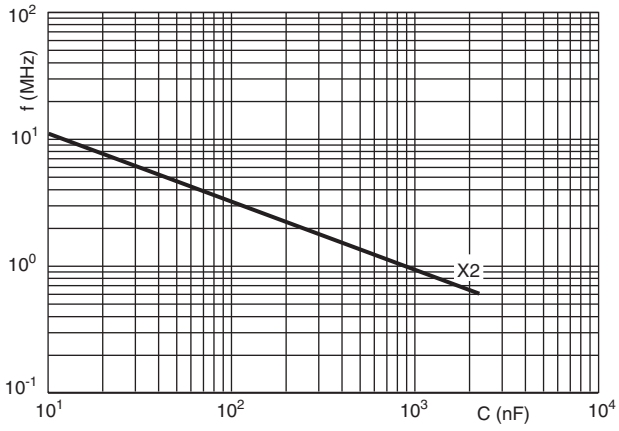
Capacitance as a function of ambient temperature
(typical curve)



Impedance as a function of frequency
(typical curve)



Tangent of loss angle as a function of frequency
(typical curve)



Resonant frequency as a function of capacitance
(typical curve)

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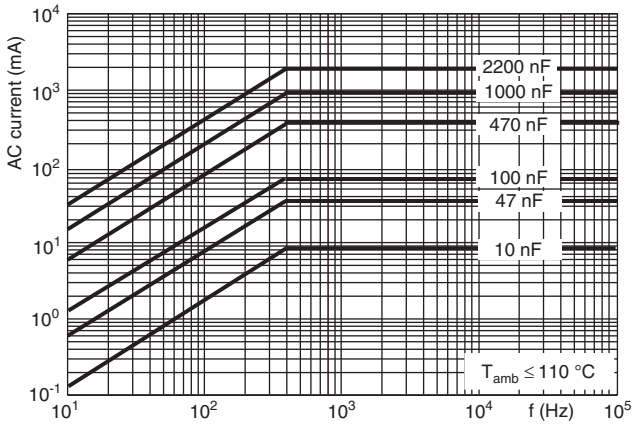

Max. RMS current as a function of frequency

APPLICATION NOTES AND LIMITING CONDITIONS

- For X2 electromagnetic interference suppression in **standard across the line applications** (50 Hz / 60 Hz) with a maximum mains voltage of 310 V_{AC}
- These capacitors are suitable for the application as voltage-division impedance in series with the mains (50 Hz / 60 Hz) with a maximum mains voltage of U_{RAC}.
- To ensure withstanding high humidity requirements in the application the epoxy adhesion at the leads shall not be damaged. Therefore the leads may not be damaged or not be bent before soldering.
- For capacitors connected in parallel, normally the proof voltage and possibly the rated voltage must be reduced. For information depending of the capacitance value and the number of parallel connections contact rfi@vishay.com.
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse program must be used.
- The maximum ambient temperature must not exceed 110 °C.
- Rated voltage pulse slope:
  if the pulse voltage is lower than the rated voltage, the values of the specific reference data can be multiplied by 435 V_{DC} and divided by the applied voltage.

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INSPECTION REQUIREMENTS

General Notes

Sub-clause numbers of tests and performance requirements refer to the "Sectional Specification, Publication IEC 60384-14 ed-3 and Specific Reference Data".

GROUP C INSPECTION REQUIREMENTS		
SUB-CLAUSE NUMBER AND TEST	**CONDITIONS**	**PERFORMANCE REQUIREMENTS**
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in Chapters "General data" of this specification
Initial measurements	Capacitance Tangent of loss angle: for C ≤ 1 µF at 10 kHz for C > 1 µF at 1 kHz	
4.3 Robustness of terminations	Tensile: load 10 N; 10 s Bending: load 5 N; 4 x 90°	No visible damage
4.4 Resistance to soldering heat	No pre-drying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	
4.19 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 min ± 0.5 min Recovery time: min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ: ≤ 0.008 for: C ≤ 1 µF or ≤ 0.005 for: C > 1 µF Compared to values measured initially
	Insulation resistance	As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
Initial measurements	Capacitance Tangent of loss angle: for C ≤ 1 µF at 10 kHz for C > 1 µF at 1 kHz	
4.20 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 min ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = -55 °C θB = +110 °C 5 cycles Duration t = 30 min	

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GROUP C INSPECTION REQUIREMENTS		
SUB-CLAUSE NUMBER AND TEST	**CONDITIONS**	**PERFORMANCE REQUIREMENTS**
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Inspection	Visual examination	No visible damage
4.7 Vibration	Mounting: see section “Mounting” of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s^2 (whichever is less severe) Total duration 6 h	
4.7.2 Final inspection	Visual examination	No visible damage
4.9 Shock	Mounting: see section “Mounting” for more information Pulse shape: half sine Acceleration: 490 m/s^2 Duration of pulse: 11 ms	
4.9.2 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ: ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured initially
	Insulation resistance	As specified in section “Insulation Resistance” of this specification
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B		
4.11 Climatic sequence		
4.11.1 Initial measurements	Capacitance Measured in 4.4.2 and 4.9.2 Tangent of loss angle: measured initially in C1A and C1B	
4.11.2 Dry heat	Temperature: 110 °C Duration: 16 h	
4.11.3 Damp heat cyclic Test Db First cycle		
4.11.4 Cold	Temperature: -55 °C Duration: 2 h	
4.11.5 Damp heat cyclic Test Db remaining cycles		

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GROUP C INSPECTION REQUIREMENTS		
SUB-CLAUSE NUMBER AND TEST	**CONDITIONS**	**PERFORMANCE REQUIREMENTS**
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B		
4.11.6 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan δ: ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured in 4.11.1.
	Voltage proof 1350 V_{DC} 1 min between term.	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section “Insulation resistance” of this specification
SUB-GROUP C2		
4.12 Damp heat steady state	56 days; 40 °C; 90 % to 95 % RH no load	
4.12.1 Initial measurements	Capacitance Tangent of loss angle: 1 kHz	
4.12.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.12.1.
	Tangent of loss angle	Increase of tan δ: ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured in 4.12.1.
	Voltage proof 1350 V_{DC}; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section “Insulation resistance” of this specification
SUB-GROUP C2A		
4.12A Damp heat steady state with load	RH: 85 %; Temp.: 85 °C; Load: 240 V_{AC} Duration: 1000 h	
4.12.1A Initial measurements	Capacitance Tangent of loss angle: 1 kHz	
4.12.3A Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 10$ % of the value measured in 4.12.1A
	Tangent of loss angle	Increase of tan δ: ≤ 0.015 Compared to values measured in 4.12.1A
	Voltage proof 1350 V_{DC}; 1 min between terminations.	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section “Insulation resistance” of this specification

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GROUP C INSPECTION REQUIREMENTS		
SUB-CLAUSE NUMBER AND TEST	**CONDITIONS**	**PERFORMANCE REQUIREMENTS**
SUB-GROUP C3		
4.13.1 Initial measurements	Capacitance Tangent of loss angle: for C ≤ 1 µF at 10 kHz for C > 1 µF at 1 kHz	
4.13 Impulse voltage	3 successive impulses, full wave, peak voltage: X2: 2.5 kV for C ≤ 1 µF X2: 2.5 kV/√C for C > 1 µF Max. 24 pulses Duration: 1000 h	No self healing breakdowns or flashover
4.14 Endurance	1.25 x U_{RAC} at 110 °C Once in every hour the voltage is increased to 1000 V_{RMS} for 0.1 s via resistor of 47 Ω ± 5 %	
4.14.7 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	|ΔC/C| ≤ 10 % compared to values measured in 4.13.1.
	Tangent of loss angle	Increase of tan δ: ≤ 0.008 for: C ≤ 1 µF or ≤ 0.005 for: C > 1 µF Compared to values measured in 4.13.1.
	Voltage proof 1350 V_{DC}; 1 min between terminations. 2120 V_{AC}; 1 min between terminations and case.	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section "Insulation resistance" of this specification
SUB-GROUP C4		
4.15 Charge and discharge	10 000 cycles Charged to 435 V_{DC} Discharge resistance: $R = \frac{435\ V_{DC}}{1.5 \times C(dU/dt)}$	
4.15.1 Initial measurements	Capacitance Tangent of loss angle: for C ≤ 1 µF at 10 kHz for C > 1 µF at 1 kHz	
4.15.3 Final measurements	Capacitance	|ΔC/C| ≤ 10 % compared to values measured in 4.15.1.
	Tangent of loss angle	Increase of tan δ: ≤ 0.008 for: C ≤ 1 µF or ≤ 0.005 for: C > 1 µF Compared to values measured in 4.15.1.
	Insulation resistance	≥ 50 % of values specified in section "Insulation resistance" of this specification

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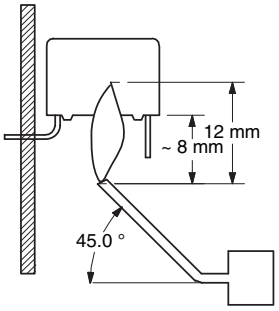
GROUP C INSPECTION REQUIREMENTS		
SUB-CLAUSE NUMBER AND TEST	**CONDITIONS**	**PERFORMANCE REQUIREMENTS**
SUB-GROUP C5		
4.16 Radio frequency characteristic	Resonance frequency	≥ 0.9 times the value as specified in section "Resonant frequency" of this specification.
SUB-GROUP C6		
4.17 Passive flammability Class B for Volume > 1750 mm^3 Class C for Volume ≤ 1750 mm^3	Bore of gas jet: Ø 0.5 mm Fuel: butane Test duration for actual volume V in mm^3: V ≤ 250: 5 s 250 < V ≤ 500: 10 s 500 < V ≤ 1750: 20 s V > 1750: 60 s One flame application  	After removing test flame from capacitor, the capacitor must not continue to burn for more than 30 s for V ≤ 1750 mm^3 and 10 s for V > 1750 mm^3. No burning particle must drop from the sample.
SUB-GROUP C7		
4.18 Active flammability	20 cycles of 2.5 kV discharges on the test capacitor connected to U_{RAC}	The cheese cloth around the capacitors shall not burn with a flame. No electrical measurements are required.

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